

WHAT IS CLAIMED IS:

1. A plasma cleaning method comprising the steps of:

placing a plate-shaped placement area protector on a substrate stage over an area corresponding to an area for a substrate placement during film formation to protect the area, said placement area protector

- 5 being made of a dielectric material and having surface dimensions and a shape matching one of: (a) surface dimensions and a shape of a substrate to be processed during film formation and (b) an area for substrate placement on a surface of the substrate stage;

introducing an etching gas into a vacuum vessel by a gas

- 10 introduction mechanism;

applying a first high-frequency electromagnetic wave power to a conductor surrounding the vacuum vessel using a first high-frequency electromagnetic wave power supply to form plasma in the vacuum vessel;

- 15 applying a second high-frequency electromagnetic wave power to the substrate stage using a second high-frequency electromagnetic wave power supply to supplementarily form plasma in the proximity of the surface of the substrate stage, wherein the frequency of said first high frequency electromagnetic wave power and the frequency of said  
20 second high-frequency electromagnetic wave power are equal;

and

removing a film deposited on the surface of the substrate stage and an inner face of the vacuum vessel by using an etching action of the introduced etching gas enhanced by the plasma.

2. The plasma cleaning method as claimed in claim 1, wherein pressure of the introduced etching gas ranges from 0.5 to 5 Torr.

3. A plate-shaped placement area protector used in a plasma cleaning method comprising the steps of: placing said placement area protector on an area for substrate placement on a surface of a substrate stage in a vacuum vessel so as to cover the area  
5 for substrate placement to protect the area; introducing an etching gas into the vacuum vessel; applying a first high-frequency electromagnetic wave power to a conductor surrounding the vacuum vessel so as to form plasma in the vacuum vessel; applying a second high-frequency electromagnetic wave power to the substrate stage so as to  
10 supplementarily form plasma in the proximity of the surface of the substrate stage wherein the frequency of said first high frequency electromagnetic wave power and the frequency of said second high frequency electromagnetic wave power are equal; and removing a film deposited on the surface of the substrate stage and an inner face of  
15 the vacuum vessel by using an etching action of the introduced etching gas enhanced by the plasma,

wherein said placement area protector is made of a dielectric material having surface dimensions and a shape matching one of: (a) surface dimensions and a shape of a substrate to be processed during film formation and (b) the area for substrate placement..

4. The placement area protector as claimed in claim 3, being formed of silica glass.

5. The placement area protector as claimed in claim 3, being formed of silicon oxide.

6. The placement area protector as claimed in claim 3, being ten times or less as heavy as the substrate to be processed.

7. The placement area protector as claimed in claim 3, being three times or less as thick as the substrate to be processed.

8. The plasma cleaning method as claimed in claim 1 wherein in said area protector placing step, a major surface of said placement area protector is placed on the substrate stage, the substrate stage having a major planar surface which is substantially free of indentations and protrusions.

9. The plasma cleaning method as claimed in claim 1, wherein the first high frequency electromagnetic wave power applied to

the conductor surrounding the vacuum vessel is applied simultaneously  
with the second high frequency electromagnetic wave power applied to  
5 the substrate stage.

10. The plasma cleaning method as claimed in claim 1,  
wherein in said area protector placing step, the substrate to be  
processed during film formation is not placed on the substrate stage  
with the area protector.

11. The plasma cleaning method of claim 9 wherein the  
conductor surrounding the vacuum vessel is disposed external to the  
vacuum vessel.

12. A plasma cleaning method comprising the steps of:  
placing a plate-shaped placement area protector made of a  
material having electrical properties which are the same as that of an  
unnecessary film deposited on a surface of a substrate stage and an  
5 inner face of a vacuum vessel during substrate processing, said  
placement area protector having surface dimensions and shape  
matching at least one of: a surface of a substrate to be processed and  
an area for substrate placement on the surface of the substrate stage,  
said placement area protector being placed on the area for substrate  
10 placement so as to cover the area;

introducing an etching gas into the vacuum vessel by a gas introduction mechanism;

applying a high-frequency electromagnetic wave power to the substrate stage from a stage high-frequency electromagnetic wave power supply so as to form plasma in the proximity of the surface of the substrate stage; and

removing the unnecessary film deposited on the surface of the substrate stage and the inner face of the vacuum vessel by using an etching action of the gas enhanced by the plasma.

13. The plasma cleaning method as claimed in claim 12, wherein pressure of the introduced etching gas ranges from 0.5 to 5 Torr..

14. A plate-shaped placement area protector used in a plasma cleaning method comprising the steps of: placing said placement area protector on an area for substrate placement in a surface of a substrate stage in a vacuum vessel so as to cover the area; introducing an etching gas into the vacuum vessel; applying a high-frequency electromagnetic wave power to the substrate stage so as to form plasma in the proximity of the surface of the substrate stage; and removing an unnecessary film deposited on the surface of the substrate stage and an inner face of the vacuum vessel by using an etching action of the gas enhanced by the plasma,

wherein said placement area protector is made of a material having electrical properties which are the same as that of the unnecessary film deposited on the surface of the substrate stage and the inner face of the vacuum vessel during substrate processing, said  
15 placement area protector having surface dimensions and shape matching at least one of: a surface of a substrate to be processed and the area for substrate placement.

15. The placement area protector as claimed in claim 14, wherein said placement area protector is ten times or less as heavy as the substrate to be processed.

16. The placement area protector as claimed in claim 14, wherein said placement area protector is three times or less as thick as the substrate to be processed.

17. The plasma cleaning method as claimed in claim 1, wherein said placement area protector is made from one of silicon, sapphire and aluminum oxide, and the etching gas comprises oxygen and one of perfluorocarbon, argon, sulfur hexfluoride and nitrogen trifluoride.